Precalc Warm Up # 1-2

Warm up sheets by the door. Tuesday space:

1. Find the equation for the parabola through (-2, 8) (1, 9) and (2, 0).

2. Solve: (2x - 1)(x - 1) = 1

3. Write the equation for the line perpendicular to $y = 3x + 5$ that passes through (-7, 18).

4. Graph: $f(x) = ax - b$; $a<0$, $b>0$

Graph $y = 2^x$ by picking points

x	y
-1	½
0	1
1	2
2	4

dom: $\mathbb{R}$

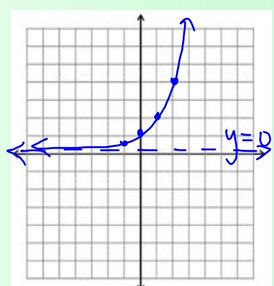
range: $y>0$

y.i.: (0, 1)

describe end behavior:

as $x \to -\infty$; $f(x) \to 0$

as $x \to \infty$; $f(x) \to \infty$



Graph $y = 2^{-x}$ by picking points

$y = \left(\frac{1}{2}\right)^x$

x	y
-2	4
-1	2
0	1
1	½

dom: $\mathbb{R}$

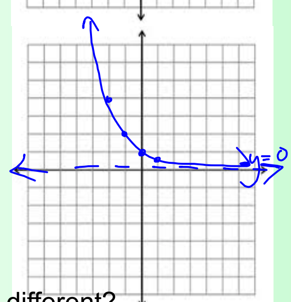
range: $y>0$

y.i.: (0, 1)

describe end behavior:

as $x \to -\infty$; $f(x) \to \infty$

as $x \to \infty$; $f(x) \to 0$



How are they the same? How are they different?

y-int

asymptote @ $y=0$

Dom & Range

Same parent

end behavior

$y = 2^{-x}$ is a reflection in the y-axis of $y = 2^x$

PC Chapter 4: Exponents and Logarithms

$\boxed{y = ab^x}$ is an exponential function, which grows when $b>1$

$a>0$

and decays when $0<b<1$

Does the following represent exponential GROWTH, DECAY, or neither?

$y = \left(\frac{7}{4}\right)^x$ G

$y = 5(0.3)^x$ D

$f(x) = 0.2\,(1)^x$ $y=0.2$ horiz line

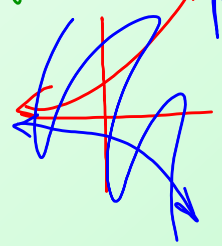
$g(x) = 3^{-x}$ $g(x)=\left(\frac{1}{3}\right)^x$ D

$h(x) = \pi^x$ G

$t(x) = 4(0.3)^{-4x}$ $t(x) = 4\left(\frac{10}{3}\right)^{4x}$ G

$f(x) = (-2)^x$ N

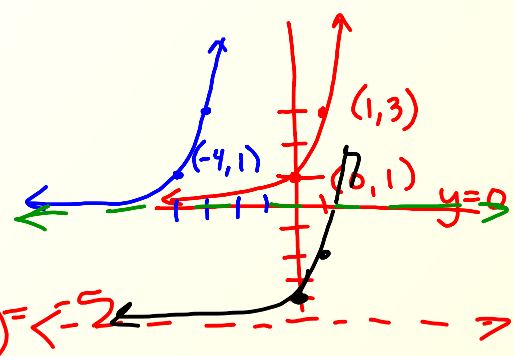
$f(x) = -2^x$ r_x N



How does the graph of $y = 3^{x+4}$ compare with $y = 3^x$?

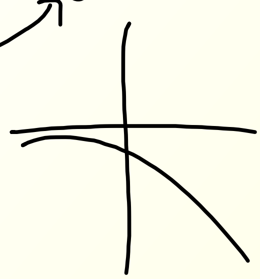
left 4

What about $y = 3^x - 5$?



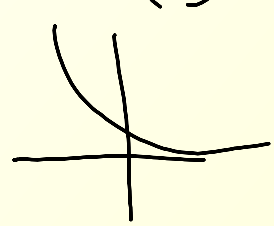
$y = -3^x$

r_x



$y = 3^{-x} = \left(\frac{1}{3}\right)^x$

r_y



Exponential Growth and Decay models.

How much money would a person would have if they deposited $1000 in an account that pays 4% annual interest rate?

$r = 0.04$

$A(1) = 1000 + 0.04(1000) = 1000(1 + 0.04)$

$A(n) = 1000(1.04)^n$

End of nth year : n	1	2	3	4
Amount \$: A(n)	\$1040	\$1081.60		\$1169.86

$1040 + 0.04(1040) =$

How much would they have at the end of 20 years?

$A(20) = 1000(1.04)^{20}$

\$2191.12

zero term

Same example: Pays 4% for 20 years
Simple interest (once/year): \$2191.12

Banks usually compound interest more frequently than just once a year. What if interest was compounded:

semiannually?

$1000\left(1 + \frac{0.04}{2}\right)^{2(20)}$

$\approx \$2208.04$

quarterly?

$1000\left(1 + \frac{0.04}{4}\right)^{4(20)}$

$1000\left(\frac{4.04}{4}\right)^{80}$

$\approx \$2216.72$

monthly?

$1000\left(1 + \frac{0.04}{12}\right)^{12(20)}$

$1000\left(\frac{12.04}{12}\right)^{240}$

$\approx \$2222.58$

daily?

$1000\left(1 + \frac{0.04}{365}\right)^{365(20)}$

$1000\left(\frac{365.04}{365}\right)^{7300}$

$\approx \$2225.44$

hourly?

$24(365) = 8760$

$1000\left(1 + \frac{0.04}{8760}\right)^{8760(20)}$

$\approx \$2225.54$

Compound interest formula

$$A = P(1+\frac{r}{n})^{nt}$$

Where A is amount of money in account after t years
r is annual interest rate (as a decimal)
n is number of compoundings per year
P is the initial amount

Find the amount of money in an account after 10 years if \$1,000,000 was deposited with a 5.3% annual interest rate compounded monthly.

0.053

$$A(10) = 1{,}000{,}000\left(1+\frac{0.053}{12}\right)^{12(10)} \approx \$1{,}696{,}950.84$$

Compounded hourly?

$$A(8760) = 1{,}000{,}000\left(1+\frac{0.053}{8760}\right)^{8760(10)}$$

$$\approx \$1{,}698{,}929.58$$

What if you could compound it CONTINUOUSLY?

$$A = P(1+\frac{r}{n})^{nt}$$

$$A = P(1+\frac{r}{big})^{big(t)}$$

Remember: $$\lim_{n\to\infty}(1+\frac{1}{n})^n = e$$

Formula for Compounding CONTINUOUSLY:

$$A = Pe^{rt}$$

Compare Continuously with Hourly:

$$A = Pe^{rt}$$

$$A = 1{,}000{,}000\, e^{(0.053)(10)} \approx \$1{,}698{,}932.31$$

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

$$A = 1{,}000{,}000\left(1 + \frac{0.053}{8760}\right)^{8760(10)}$$

$$\approx \$1{,}698{,}929.58$$

What if you wanted to have $1,000,000 when you retired at age 68? How much would you need to invest when you graduate at age 18 if you find an investment that pays 5% compounded monthly?

$$1{,}000{,}000 = P\left(1 + \frac{0.05}{12}\right)^{12(68-18)}$$

$$1{,}000{,}000 = P\left(\frac{12.05}{12}\right)^{600}$$

$$P = \frac{1{,}000{,}000}{\left(\frac{12.05}{12}\right)^{600}}$$

$$P \approx \$82{,}512.45$$

Your course syllabus can be found online at:

nicholsonsehs.wikispaces.com

HW: PC book

p. 259 # 3, 7, 11, 15-22,

and # 23-53